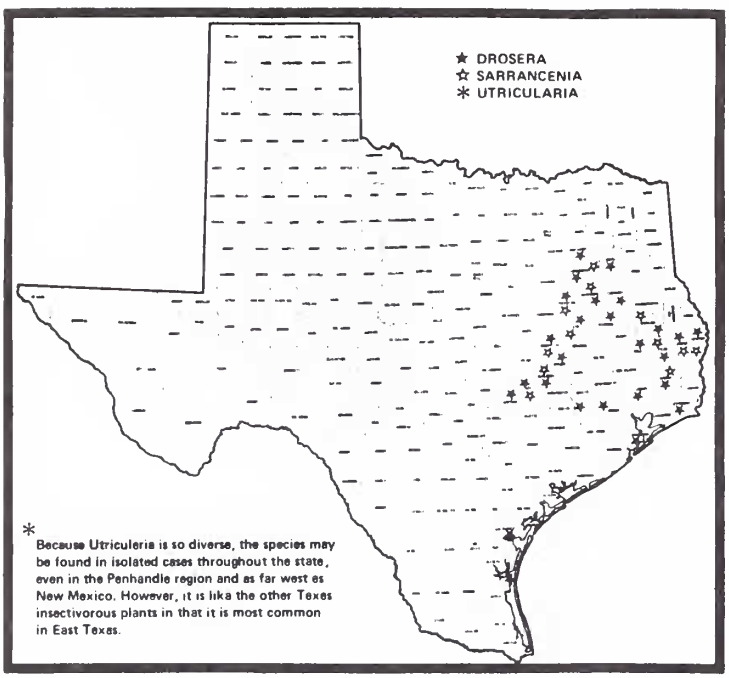
CARNIVOROUS PLANTS OF TEXAS
by Grady Lucas

In Texas there are fifteen species of carnivorous plants representing four genera in three families. These genera are Sarracenia, Drosera, Utricularia, and Pinguicula, the latter found throughout the state. The greatest concentrations of CP species in the state are found in the east and southeast portions where the rainfall is greater and the soil more commonly retains water in such forms as bogs, seepages and savannahs. This generalization as to habitat does not necessarily include Utricularia which are found in fresh water throughout the state. However, Utricularia are more common in the eastern part of the state.



All Texas varieties of CP seem to be fairly hardy. In some areas CP have increased in population because of man-caused habitat changes. An example of such changes is an area where power lines are constructed and the digging near the seepages makes the soil "boggy". Sarracenia and Pinguicula are frequently found in these boggy areas.

The largest of the Texas CP is Sarracenia alata. This is the only species of Sarracenia native to Texas, and in the wild ranges from six to twenty-eight inches in height. In Texas Sarracenia alata blooms from April through May.

Next in the Texas delegation of CP is Drosera. The only species native to Texas is Drosera brevifolia. These plants are either perennial or biennial, and the flowers bloom from early February to late August. In late autumn and early winter the leaves turn deep red and are easy to spot against the dying vegetation.

Utricularia are probably the most common CP in the world. Of the 170 species in four genera, Texas has ten species occurring throughout the state. One of the largest known concentrations of Utricularia in the state is on Caddo Lake with five or six acres inhabited. Recent studies suggest that Utricularia occasionally trap duckweeds which would make them herbivorous as well as carnivorous.

Utricularia vary greatly in size and distribution over the state. Water conditions for one species in the eastern portion of the state probably would not sustain another variety from central Texas. In other words, specific habitat requirements such as oxygen content and minerals in the water must be met for the plant to survive. This is why soft acidic water in east Texas harbors different species than the relatively hard alkaline waters found in central Texas.

Of the thirty-five known species of Pinguicula, Texas has only one, Pinguicula pumila, which may be found in southeast Texas.

PRELIMINARY EXPERIMENTS ON THE EFFECTS OF PLANT HORMONES IN GERMINATION OF BYBLIS GIGANTEA SEEDS
by Donald Schnell

Regular readers of CPN are familiar with the difficulties involved in germinating seed of Byblis gigantea, and those who have tried it are often frustrated by irregular results. There is far less problem with the mainly annual B. liniflora. The difficulties with B. gigantea have been attributed to a short half-life viability after seedset, an unusually resistant seed coat, and exacting environmental requirements in its native habitat which have been insufficiently studied and therefore are not at all understood. Many novel techniques have been devised to prod recalcitrant seed into germination, most of these revolving around some sort of heat treatment and a great deal of patience as germination proceeds over a period of several months to a year or more. The rationale behind heat treatment has been that the moist and then drying sandy soil in Byblis areas heats up to rather high temperatures during certain seasons and this may play a key role in the plant's phenologic activities.

In an attempt to further study the process of seed germination in this species, we thought of substituting trial by hormone for trial by fire. The following experiments were carried out.

New 6 cm. white square plastic pots were thoroughly rinsed in hot tap water (non-chlorinated, conductance less than 40 mhos) and air dried. They were then filled to within 1 cm. of the top with a 50/50 mix of fine white washed quartz sand and Canadian peat (Premier brand). The mixture was wetted by pouring nearly boiling tapwater through the pots until the "soil" was well saturated. All pots were then completely cooled to ambient room temperature in the open air. Unwashed and untreated B. gigantea seed that was a year or more old* was then distributed over the surface of the growing mix, 20-25 evenly spaced seeds per pot. The seeds were not covered.

Next, the following hormone** mixtures were made up using distilled water and these were carefully watered through the mix until we felt the added solution was dripping through. We used medicine droppers in order not to disturb or cover the seeds with floating particles of planting mix. A control pot received distilled water only. The pot numbers and their respective hormone "cocktails" were (results in parentheses):

1. Control--(No germination in 61 days)
2. Yeast extract (Difco 0127-02, control 567058), 3 g/L--(No germination in 61 days)
3. Gibberellic acid (75% K salt), saturated aqueous sol. at 25 C--(60% germination in 9 days, none thereafter)
4. 1-Naphthylacetic acid, .024 mg/dl, and Thiamin, .045 mg/dl--(No germination in 61 days)
5. Gibberellic acid (75% K salt), sat. aqueous sol, at 25 C--(20% germination in 12 days)
6. Kinetin riboside, 10 mg/dl, and 1-Naphthylacetic acid, .024 mg/dl--(30% germination in 10 days)
7. Gibberellin A7, sat. aqueous sol. at 25 C--(20% germination in 11 days)
8. Gibberellin A7, sat. aqueous sol. at 25 C, Kinetin riboside, 10 mg/dl, 1-Naphthylacetic acid, .024 mg/dl--(85% germination in 8 days)
9. Kinetin riboside, 10 mg/dl--(No germination in 18 days)

The pots were placed in a glass-covered terrarium, above the floor so there would be no hormone runoff crossover from pot to pot. The terrarium setup was not watered any further and was placed under a 37 cm. wide 4x40 watt bank of Verilux^{c} tubes, these being 15 cm. from the seeds. Temperatures varied from 18-20 C at night to 26-27 C days and the photoperiod was 16 hours. The results of the experiments are listed above after the hormone formulations.

We can readily see that excessive heat was not a factor in germination successes, nor was some unknown factor from native soil present (unless serendipitously so in our mix!). We can also see that certain hormone mixtures, particularly pots 3, 6, and 8, were very effective in stimulating germination. Particularly, solubilized kinetin (riboside) and gibberellins seem to have a mutually potentiating effect. The auxin was of little help unless combined with a gibberellin, or a gibberellin and kinetin.

The germinating seeds exhibited a peculiar characteristic in that geotropism seemed to be lost and seedling roots sprouted up in every direction, mainly into the air, and successful rooting was tremendously diminished. Attempts to place the seeds upright resulted in eventual death of the seedling in 2-8 days anyway, possibly due to air drying, light damage or mechanical damage to brittle rootlings. Those seedlings that did germinate upright progressed to the 3-4 leaf stage and then damped off. (We did not interfere with this process since this would have entailed moving the pots to administer fungicides or risk getting same into other pots and thus bring an unknown into the experiment.) Since the seeds of this species are so small, we arbitrarily followed the precept of sowing them on the surface rather than covering them. In future experiments, we plan to cover the seeds with a thin layer of mix to see if this will encourage proper direction of the root and increase seedling survival. Also, future experiments will be required to exactly sort out which factors in the various "cocktails" were most important by making additional combinations and varying concentrations.

These experiments are, of course, too preliminary to draw conclusions with any finality at this point. However, we have managed to get germination in a relatively short period, with many seeds germinating at once rather than sequentially over a protracted period, using the hormone mixes above. We cannot even begin to hazard the opinion that this in some way mimics the natural process of germination in the plant's natural habitat. The complex interactions of heat on the seed coat and on various chemical processes within the seeds, enzymes and hormone co-reactions, inhibitions and stimulations, and water dynamics could all enter into the process of germination to varying degrees. Whether our seed treatments mimicked, bypassed or followed alternate pathways of the germination process cannot be decided at this time. Further work will await another supply of seed!

*We are grateful to Joe Mazrimas for a generous supply of seed.

**Obtained from ICN Life Sciences Group, Cleveland, Ohio.